PAR 237

Briefing Aids

31 March 1965

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PROJECT AUTHORIZATION REQUEST

PAR 237
31 Mar 65

SUBJECT: Briefing Aids

TASK/PROBLEM

1. Design, prepare and submit for customer approval sketches of proposed briefing aids for those PARs selected by the customer.

2. Upon receipt of customer approval, prepare and submit briefing aids.

PROPOSAL

3. Introduction: Aids will be used by the customer during briefing of management and technical type personnel on program status. Both briefing boards and teleprompter slides are required for this purpose; slides of each briefing board are required for viewing distances greater than thirty feet. The scope of effort as proposed herein is limited to the preparation of the following briefing boards and to the procurement of one unmounted, positive color transparency of each board:

a. PAR 202, Briefing Print Enlarger, and PAR 224, 3X - 15X Fluid Gate Enlarger (4 Boards).

(1) General arrangement.

(2) Optical schematic.

(3) Relationship of magnification, focal length, and negative to platen distance.

(4) Focus adjustment.

b. PAR 206, Reversal Processing Study (3 Boards)

(1) Test results: August 1963 and October 1964.

(2) B&W - Compar. w/standard processing.

(3) B&W dupe neg. - Compar. w/standard processing.

c. PAR 207, Contact Printer Study (4 Boards).

(1) Measurement - Superimposed halftones.

(2) Moire' Patterns.

(3) Sharp-edge reproduction test.

(4) Resolution.

d. PAR 211, Image Effect Study, Nos. 4 through 7 - Sequence of Efforts (4 Boards).

e. PAR 212, Color Acq. Study (4 Boards).

(1) Haze attenuation.

(2) Film response.

(3) Acquisition attitude and film selection.

(4) Film latitude.

f. PAR 213, Color Dupe Study (8 Boards).

(1) Two charts - High alt. acq. of 14 Aug 64.

(2) Two charts - Color stereo system.

(3) High alt. acq. of 14 Aug 64.

(4) Enlarging systems.

(5) High alt. acq. of 14 Aug 64.

(6) Color printing.

g. PAR 214, RT-12-R (3 Boards).

(1) General configuration.

(2) Reversal process.

(3) Negative process.

h. PAR 215, RT-24 (2 Boards)

(1) General configuration.

(2) Process.

i. PAR 217, Blue-Green Laser Study, Schematic Diagram of System for Second Harmonic Generation of 0.53 Micron Laser Radiation (1 Board).

j. PAR 222, Stereo Image Regis. (5 Boards).

(1) Breadboard schematic.

(2) Rotation-scan signal relationship.

(3) Vertical displacement.

(4) Horizontal displacement.

(5) Magnification diff.

4. Approach: Sketches of the boards specified herein will be prepared in accordance with Appendix "A". Two prints of each sketch will be submitted to the customer. One print of each board selected by the customer shall be returned to the contractor; changes and/or special instructions shall be specified on this print. The return of a print shall be considered authorization to proceed with the preparation of that board, and to procure an unmounted, positive color transparency of the deliverable briefing board. The board and the transparency shall be prepared in accordance with Appendix "A", Standards for Visual Aids, dated 31 Mar 65.

PROGRAM OBJECTIVE

5. This program is proposed to provide briefing boards selected by the customer which are legible at viewing distances up to thirty feet, to provide for standardization of these boards, and to provide one unmounted, positive color transparency of each board.

SCHEDULE

6. Delivery of the boards and transparencies is subject to the schedule with which approval prints are returned from the customer. Positive color transparencies of the proposed 38 briefing boards will be processed in two groups of approximately twenty. Boards will be held at the contractor's facility until the related group of positive color transparencies is ready for shipment. A matching group of twenty boards and twenty transparencies will be shipped by the contractor sixty (60) days after approval of a twenty-board group.

APPENDIX "A"

Attachment to
PAR 237

31 Mar 65

Standard for Visual Aids

1.0 General

These standards provide briefing boards for the [redacted] contract which will be legible when viewed from a distance of thirty (30) feet. Primarily, the content of these boards will be used to brief management-type personnel on program status. To accommodate larger audiences at viewing distances greater than thirty (30) feet, teleprompter slides will be made of these boards. STAT

2.0 Proposal Sketches

Sketches of "all" proposed briefing boards shall be submitted to the customer for approval. These boards shall be identified by the PAR No., the Chart No., and a date. This identification data shall be located in the upper right hand corner of the sketch sheet. When "new" material must be prepared, the following standard should be followed in preparation of sketches of proposed 22" x 30" briefing boards:

(a) Size of submittal sheet: 8.5" x 14".

(b) Major axis of "Submittal Sheet" format: horizontal.

(c) Location of Briefing Board Outline: 1 1/8" from left edge of sheet and centered on vertical 8 1/2" dimension of the submittal sheet.

(d) Outline of the 22" x 30" Briefing Board: 1/4 size (horizontal or vertical orientation).

(e) Location of PAR No., Chart No., and date: Upper right hand corner of submittal sheet.

(f) Except for the identification, etc., in the upper right hand corner, the right side of the sheet is for customer comment and/or approval. However, when double format or vertical format are considered necessary or desirable, this should be annotated on the right hand side with an explanation for the recommended format.

(g) Board color (background) should be specified on the submittal sheet.

2.1 Submittal Requirements

Two prints of each proposed chart are required by the customer.

3.0 Briefing Board Requirements

3.1 Board Material

Show-card material with stiffness equal to or greater than Crescent Illustration Board No. 300 or No. 310, cold press surface, medium weight.

3.1.2 Briefing Board Color

Boards with gray or colored background are preferred.

3.2 Briefing Board Sizes

Horizontal format should be used whenever possible.

Horizontal Format	22" High x 30" Wide
Vertical Format	30" High x 22" Wide
Double Format	30" High x 44" Wide

3.2.1 Art Work and Data Area

a. Single Format:

Horizontal:	17 3/4" High x 25" Wide, centered on 22" x 30" Board
Vertical:	25" High x 17 3/4" Wide, centered on the 30" x 22" Board

b. Double Format:

Horizontal:	25 3/4" High x 39" Wide, centered on the 30" x 44" Board
Vertical:	39" High x 25 3/4" Wide, centered on 44" x 30" Wide Board

3.3 Lettering

In general, block lettering without serifis is acceptable; it is preferred that titles, subtitles, and annotations be made with "Headliner".

3.3.1 Size and Style of Lettering

The following are in the order of preference:

Titles:

(1) 72 Point Capitals and Numerals, Futura Bold, (Headliner)

(2) Block Lettering, hand lettered, 1" High, No. 1/2 Speedball Pen

Subtitles:

(1) 60 Point Capitals and Numerals, Futura Bold (Headliner)

(2) Block Lettering, hand lettered, 3/4" High, No. 1 Speedball Pen

Annotations:

(1) 60 Point Capitals and Numerals, Futura Semi Bold (Headliner)

(2) Block Lettering, 5/8" High, No. 2 Speedball Pen or equivalent lettering

3.3.1.2 Location of Titles

Shortened PAR titles shall be located in the upper left hand corner of the briefing board, 2 1/2" from the left edge and 2 1/8" below the top edge.

Subtitles shall be spaced 7/16" below the title and 2 1/2" from the left edge of the briefing board.

3.3.1.3 Line Spacing

Blocks of printed matter (5/8" High) for more than one line shall have a space between lines of 3/8".

3.4 Delineations

Sketches, diagrams, tables, graphs, etc., contain lines; the weight of these lines will have to be selected for best appearance. Their thickness will vary with the complexity of the subject. The following line weights are considered minimal for legibility at a viewing distance of thirty (30) feet:

Line Weights	Minimal Width of Line
(a) Grid lines, diagram details Lightest table rulings	1/32"
(b) Borders, heavy table rulings Outlines of vessels and structures	1/16"
(c) Data lines on graphs, flow lines on charts	1/8"
(d) Minimum width and spacing of color coded lines	3/16"
(e) Extension lines (call outs)	1/16"

4.0 Positive Color Transparencies

The images reproduced on these slides will be those of the Briefing Board or equivalent.

4.1 Physical Characteristics

Size: Suitable for use in 3 1/4" High by 4" Wide glass mounts. The image area shall be 2 5/8" High by 3 1/2" Wide

4.1.2 Format

The major axis shall always be horizontal.

LEGIBILITY STANDARDS FOR PROJECTED MATERIAL

Notes from an address by Adrian L. TerLouw, Education Consultant, Eastman Kodak Company, before the Indiana State Conference on School Planning for Audio-Visual Education.

Every day several million students are being asked to look at something at the front of the classroom and learn. It would seem obvious that the teacher would make sure that the students in the back row can see what he is showing them. Yet, how many classroom materials are designed with any standards in mind?

How many teachers can tell you how large their writing has to be on the chalkboard to make sure all the students can read it rapidly and accurately? This assumes, of course, that the writing is in itself legible.

How many maps are made so that the names of the countries are legible even from the middle of the classroom?

How do we make sure that the names and numbers in tables, graphs and charts are legible in the slides we project on the screen?

There is, therefore, a real and pressing need to set up certain standard practices to make sure instructional materials are legible. This discussion aims to make a start in that direction.

The legibility of anything viewed in the classroom is tied to the characteristics of human vision. In order to discriminate between two symbols such as 5 and 6, a capital N and V, or F and E we have to meet several "seeing" conditions.

These factors fall into two main categories:

1. The design of the material displayed

   The symbols and details to be discriminated must be large enough and of good design and visual contrast.

2. The conditions under which it is displayed

   Some of the factors to be considered are--the brightness of the task area, the presence of high contrasts and bright spots in the surrounding field of view that cause glare within the eye and the presence of contrast-reducing illumination (surface glare on materials viewed by reflected light and general illumination of the screen for projected material; non-image forming light).

Punched to fit the Kodak Photographic Notebook.

Since these two factors are so closely interrelated we can't set up standards for one independent of the other. So in concentrating on design we are going to have to make certain assumptions about viewing conditions.

Viewing Conditions

Although we can't assume that ideal viewing conditions can be achieved at all times in every classroom, some minimum standards have to be assumed. Here are the ones on which the present discussion is based:

For material viewed by reflected light

The illumination on the surface to be viewed is equal to or somewhat greater than that falling on other surfaces within the field of view.

The illumination on the task area is at a level between 25 and 50 foot-candles.

The direction of the illumination of the task area is such that no surface glare (specular reflection) is produced.

There are no bright areas within the field of view (sky, concrete, snow, glass block installations, sunlit objects in the room) that have a brightness in excess of the instructional material.

For material viewed by projection

A screen image with a long dimension 1/6 the distance from screen to farthest viewer. A value of 1/8 is tolerated.

A screen image brightness produced by the projector at least twice as great as any bright area in the field of view. This must hold for every member of the class

A minimum screen brightness of 9 foot-lamberts for every member of the class, even those off to the side at the greatest viewing angle. A level of 20 foot-lamberts is preferred.

The relation between the brightness of the screen with the projector turned on but the lens capped (non-image brightness) to the brightness of the screen when illuminated by the projector with a blank slide with a clear mask opening should be appropriate for the material being shown.

Class of material	Non-image brightness / Projector image brightness
Class A	
Full scale B & W and Color where pictorial values are important and color differences must be discriminated.	$\frac{1}{100}$ ($\frac{1}{300}$ preferred)
Class B	
Color diagrams and continuous tone B & W in high key.	$\frac{1}{25}$
Class C	
Simple line material such as text, tables, diagrams and graphs.	$\frac{1}{5}$

Good optical performance of the projector lens to give a sharp image free from noticeable (from audience position) color fringing and flare.

We also have to make certain assumptions about the quality of the vision of the audience. We can't assume everyone has 20-20 vision. Because seeing is so important in learning, it is reasonable to expect that elementary and secondary schools will take steps to detect vision defects and arrange for correction by appropriate medical care and will also take vision characteristics into account in assigning seats in the classroom. With college and adult audiences this is serious. Hence a safety factor of about 2 is advisable.

On the basis of these assumptions we can proceed to talk about standards of design for visuals for instruction.

Visual Acuity

The basic factor controlling design of teaching visuals is the limitation of the eye in discriminating small details in the field of vision. The measure of this is the visual acuity of the eye. In this connection both size and contrast of the detail have to be taken into account.

With the standards or assumptions we have made the contrast factor drops out if we are talking about black letters on white paper or the reverse. In the case of photographs or low contrast art work such as is demanded for television, it is a consideration. For the

moment let's confine ourselves to black and white line subjects such as text, tables, graphs and outline sketches.

For this class of material experiments have shown that the smallest symbol to be discriminated must subtend 9 minutes of arc. We can transpose this into a working table:

Viewing Distance	Minimum Symbol Size*
128 feet	4 inches
64 feet	2 inches
32 feet	1 inch
16 feet	1/2 inch
8 feet	1/4 inch

*This is the height of the body of the type face. When upper and lower case are used it is the body height of the lower case characters.

Symbol Design

When the size of letters and figures exceeds these minimum standards by a considerable amount liberties can be taken with the type face employed. Even then, however, it is wise to avoid extrabold and condensed faces. A sans-serif medium weight face of normal proportions is always a safe bet. Certain type faces with serifs are satisfactory above minimum size but even then avoid those that are heavily shaded.

For titles, short statements and labels it is advisable to stick to upper case alone. When there is a great deal of text such as in complex tables it is sometimes advantageous to set in upper and lower case. In this instance the height of the body of the lower case letters is the critical dimension.

Line spacing is an important factor in legibility. If the lines are too close together they will be hard to read. A good starting point is a line spacing of $1\frac{1}{2}$ times the height of the letters for blocks of printed matter of more than one line.

Line Weight

Sketches, diagrams, tables, graphs and the like contain lines. The weight of these lines will have to be selected for best appearance. Their thickness will vary with the complexity of the subject. The ultimate test is to view the visual under the conditions in which it will be used.

For graphs and tables it is possible to set up a few rules. Minor rulings and grid lines in graphs should be about one half the thickness of descenders of the type. Major rulings in tables and data lines in graphs can be equal to the type line weight. In tables it is better to use a double ruling for major divisions than a single line.

Direct Viewing vs. Projection

When the proper conditions for projecting the class of material being shown can be met it is usually preferable to use a projector for presenting the material to view. Here are some of the reasons:

Economy of space and convenience

Charts and other graphics have to be large to provide adequate visibility in a 30 foot classroom (30x40 inches). If there are very many they present a real problem in storage; also they are very cumbersome to handle. When converted to transparencies, charts lose this awkwardness.

Versatility

A chart is restricted to a specific maximum viewing distance. A transparency on the other hand can be used with a wide range of audience sizes by employing the correct combination of screen and projector.

Effectiveness

The compactness of the transparency presentation makes it practical to employ the technique of progressive disclosure in developing a topic. This together with elimination of the physical distractions of manipulating a large number of charts makes the presentation by projection more effective.

Cost

A large chart or graph is, in general, more costly to produce than smaller size art work and reproduction in the form of a transparency. The latter will stay in good condition longer. Large size photos, especially in color, are prohibitive in cost. Small transparencies in color are relatively inexpensive.

Multiple-Use Art Work

In technical and scientific presentations it is often desirable to use the same art work of graphs, tables, diagrams, etc. for publication and the production of transparencies for projection. This can be accomplished by adopting drafting procedures based on a 6W* maximum viewing distance. The resulting art work will repro-

* "W" refers to the longer dimension of the projected image. For example a 6W viewing distance for a 3 x 4 foot image would be 24 feet; for a 4 x 6 foot image it would be 36 feet.

duce with an appearance that is compatible with the type face and page color of current technical journals. This table interprets such standards based on the use of Leroy lettering apparatus:

DRAFTING STANDARDS

Maximum viewing distance - 6W.
Art work (dimensions of area to appear on screen) 6 3/4 x 9 inches.

Letter Height

Smallest	140C	Pen No. 1
Grid captions and scale numerals.		
Medium	175C	Pen No. 2
Part labels, symbol keys, etc.		
Large	240C	Pen No. 3
Main title.		

Line Weights

Light	Pen No. 00	(0.013")
Grid lines diagram details		
Medium	Pen No. 1	(0.021")
Borders, outlines of vessels and structures		
Heavy	Pen No. 4	(0.043")
Data and flow lines		

Television as a form of projection

It is not uncommon today to find that a visual produced primarily for classroom use may also be used for a television presentation. If this is likely the characterisitcs of television as a transmission system and the habits of its viewers should be taken into account.

Most people don't like to sit too close to the picture tube because they are conscious of the lines that make up the image. This occurs at about 4 times the tube width. With a 21 inch tube this minimum distance is about 7 feet. At the other end of the scale we find it is not uncommon for people to sit 18 feet (10W) or 20 (12W) away. Obviously charts, graphs, sketches and photographs designed for 6W standards will not be legible at these maximum distances. A design point of 12W is advisable for material that may be used on television.

This calls for a letter twice as large as that specified for the 6W viewing distance. Obviously this greatly reduces the amount of data that can be presented to the television viewer at one time. It also means that the general views so useful for orientation may not be satisfactory on television although they are admirable and effective

when projected at 6W standards with an optical system. Television calls for a much bolder treatment.

Another matter to be considered in television art work is the limitation in contrast reproduction inherent in the system. Because of this, black symbols on gray or white symbols on gray should be used. Graphs and tables are most effectively handled by using a gray with about 25 percent reflectance for the background. Grid and reference lines are white; numbers, legend and data lines are black.

Universal table for symbol height

If we specify the minimum symbol height as a fraction of the narrow dimension (H) of the art work area to be reproduced on the screen we can create a table that indicates the minimum size of characters for a variety of maximum viewing distances.

Distance of farthest spectator	L/H	Minimum height of symbol	
		6 3/4" x 9" art work	9 x 12 art work
4W	1/75	.09"	.12"
6W	1/50	.13"	.18"
8W	1/35	.19"	.26"
10W	1/30	.22"	.30"
12W	1/25	.27"	.36"

Pictorial Material

From what has preceded it is apparent that the legibility of symbols when projected can be predicted quite accurately. This is not the case with photographs. The only reliable test for legibility of this class of material is actual projection under the conditions that will exist where they are used. The relation of the brightness of the image and the amount of non-image brightness caused by room illumination must be matched in the test situation. The image should be viewed from the end seat in the back row and also from the seating position at the greatest angle to the screen.

A general idea of the effectiveness of a photograph or a drawing can be secured by viewing it from a distance of 6 times its longer dimension for conventional projection and 12 times this dimension (it should be a horizontal format) if it is to be used on television. An 8 x 10 print would be test viewed at 10 feet to get an idea of how it would appear to a person looking at a 21 inch TV tube from the far side of a medium size living room.

Labels in photographs

In many subjects it may be desirable to place labels or directional arrows in the scene during the original photography. To be sure they can be read the dimensions in the universal symbol height table should be used. The narrow dimension of the field of view and the L/H value are used. For example, if the field of the subject included in the photograph is 24" x 36", the smallest letters should be 1/2" for a 6W maximum viewing distance. A 72" x 108" field would call for 1 1/2" letters. Because machinery and installations are frequently dark in color it is best to use a light gray card rather than white for labels. This prevents loss of clarity of letters and numbers through overexposure.

At first glance these specifications may seem complex and difficult to apply. Actually they become quite simple if certain standard practices are adopted. With a 6W maximum viewing distance and a 6 3/4 x 9 inch art work size the creation of art work to meet requirements of good legibility becomes simple. Incidentally art work of this size can be stored in a conventional letter file.

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Legibility Standards For Projected Material 5-56L KP

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